REMARKS

Status of Claims

Claims 1-22 are presented for examination.

Claims 1 and 12 (and 18) have been amended to correct a translation error. Support for the correction can be found in paragraph [00025] of the specification as filed, i.e., "The maximal permissible content of metal in the deposited material depends upon the later purpose of employment, conventionally however lies below 10 vol.%."

Claims 1 and 12 are further amended to recite 70 vol. %. Support can be found in paragraph [00020] of the specification as filed.

Claim Rejections - 35 USC § 112

Regarding claim 1, at lines 8-9 the claim recites "more than 70%" without providing whether the percentage is by weight or volume. Appropriate correction is required.

In response, Applicants amend claim 1 as discussed above.

Regarding claim 12, at lines 1-2 the claim recites "A composite material...by depositing". This claim language is indefinite as it does not describe the relationship between the claimed material and the act of deposition. Amending the claim to read " A composite material...formed by depositing" or the like will overcome the rejection. Appropriate correction is required.

Claim 12 has been amended as suggested by the Examiner.

Regarding claim 12, at lines 8-9 the claim recites "more than 70%" without providing whether the percentage is by weight or volume. Appropriate correction is required.

Claim 12 has been amended as suggested by the Examiner.

Claim Rejections - 35 USC § 102 and 103

Claims 1-4, 6-17, and 19-22 are rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Haug et al. (US 2002/0034643).

According to the Examiner, Haug et al. teach a process for producing a composite material and the product made thereby comprising metallic, intermetallic, and ceramic phases (paragraph [0007]). The process may include arc wire spraying (paragraph [0014]) which results in reaction during depositing to form the intermetallic phase (paragraph [0013]). Arc wire spraying necessarily includes use of two wires comprising a composite wire of metal or a metal alloy to induce the short that causes the welding action to occur. Further, ceramic particles are taught as being present when arc wire welding is used (paragraph 0015.

Applicants are familiar with this reference as it is assigned to the assignee of the present application. Applicants offer the following distinguishing comments.

Haug et al teaches applying a ceramic layer onto a metal substrate to form a surface layer comprising a plurality of layers, of which one layer is a transition layer. The surface layer includes a ceramic layer, the substrate element is a metallic substrate element, and the translation layer contains intermetallic phases including the metal of the substrate material and the metal of the ceramic (i.e., the ceramic layer must be a PURE CERAMIC layer; reference to "chemically bonded metal" can only mean the metal is part of the ceramic (bonded to oxide, nitride, etc.).

See Haug et al paragraph [00013] "The invention further includes a process for producing a surface layer. In this process, a ceramic layer is applied to a metallic substrate element. … During this reaction, a transition layer, which contains intermetallic phases and ceramic phases in accordance with Eq. 1, is produced in the reaction zone. The reaction-bonded transition layer is securely joined to both the substrate element and the ceramic layer, which according to the invention ensures very good adhesion."

See also paragraph [00015] "Particularly with the abovementioned thermal spraying processes, energy which brings about the reaction between the substrate element and the ceramic layer may be introduced in situ. This takes place if a ceramic powder, when it comes into contact with the substrate material, is at a temperature which is sufficient to initiate a reaction. …."

The critical reaction thus occurs between the METAL SUBSTRATE and the ceramic layer being deposited (AFTER DEPOSITION, not prior to deposition).

The present invention in contrast is based on controlling a reaction between components of a feed wire – the reaction between metal alloy and ceramic particles OF THE WIRE - as they undergo reaction DURING depositing. As a result, the composition of the deposited layer is dependent upon the composition of the composite wire, and independent of the substrate.

In fact, Applicants point out that the present claims are directed to a deposited layer formed by the composite material as such WITHOUT specifying a substrate!

It is an important advantage of the present process that the composition of the substrate DOES NOT influence the composition of the layer. No reaction occurs between the components of the composite wire and substrate in order to form the deposited layer. The substrate is not chemically altered according to the reaction scheme of the present claims.

Thus, the present process produces a deposited layer using the materials being deposited, independent of the substrate.

In order to clarify the differences between the present invention and Haug et al, Applicants have amended present claim 1 to more clearly claim a process for producing a layer of a composite material of metallic, intermetallic and ceramic phases by depositing the layer forming ~~it's~~ components by means of arc wire spraying with at least one composite wire of metal or metal alloy and ceramic particles, wherein these composite wire components undergo reactions with each other during depositing forming intermetallic phases and new ceramic phases, wherein more than 70 vol. % of the ceramic particles undergo reactions during the spray processing with formation of intermetallic phases and new ceramic phases, and wherein the metal or the metal alloy of the composite wire reacts to the extent that unreacted metal or metal alloy ~~it reacts,~~ constitutes less than 10 vol.% of the formed composite material.

Thereby it becomes possible, with the present invention, to form a layer uniform in consistency, of any desired thickness.

With Haug et al, in contrast, it is only possible to form layered coatings (see Haug et al Fig. 1), presumably with a gradient composition (high metal content near the substrate and high ceramic content near the surface); yet our composite contrasts this by being a homogenous and gradient-free material.

Further, with Haut et al it is necessary that the surface layer is a pure CERAMIC layer! This is in contrast to the present invention.

Accordingly, claim 1 is not anticiptated by Haug et al.

Applicants further submit that, in view of the structural differences between the produced layers, which is a direct result of the different processes, claim 1 is not obvious over Haug et al.

According to the Examiner, Haug et al. do not specifically teach the amount of ceramic particles and metal or metal alloy that react to form the composite. However, as Haug et al. teach the same components claimed (metal or metal alloy wire and ceramic particles) used in the same manner claimed (arc wire spraying), it is expected that the components will interact in the same manner as claimed.

In response, Applicants refer the Examiner to claim 1, as amended, to recite, inter alia, a process for producing a layer by depositing the layer forming components by means of arc wire spraying, wherein these composite wire components undergo reactions with each other during depositing forming intermetallic phases and new ceramic phases, wherein the metal or the metal alloy of the composite wire reacts to the extent that unreacted metal or metal alloy constitutes less than 10 vol.% of the formed composite material. Thus, claim 1 as amended indicates that the layer is formed by the reaction of the deposited materials themselves during the deposition process, and not formed by the reaction between deposited ceramics and metallic substrates.

Regarding claim 2, arc wire spraying necessarily includes use of two wires comprising a composite wire of metal or a metal alloy to induce the short that causes the welding action to occur. The metal of the second wire will interact with the ceramic powder taught by Haug et al. as like materials are used in a like manner as claimed.

However, in Haug et al wire arc spraying to form the ceramic layer is merely one of a long list of possible disclosed techniques. Any conventional coating processes can be used in Haug et al., including physical and chemical deposition processes, such as sputtering, sole-gel processes, electrodeposition or CVD coating; painting techniques (e.g. dip painting or spraying) or slip techniques as are customary in the production of ceramics are particularly suitable, allowing a particularly inexpensive layer to be produced; and furthermore, thermal spraying processes, such

as flame spraying, high-speed flame spraying, plasma spraying, wire arc spraying or kinetic cold gas compacting are expedient coating processes. The thermal spraying processes ensure a particularly dense layer and can likewise be produced at low cost.

Thus, Haug et al do not specifically lead to the wire arc process, and in particular, do not suggest the process of claim 1 with all limitations discussed above.

Accordingly, withdrawal of the rejection based on Haug et al is respectfully requested.

Next, claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haug et al. (US 2002/0034643) in view of Haug et al. (US 2002/0028342).

Haug et al. '643 teach a process for producing a composite material and the product made thereby as discussed above. Haug et al. '643 do not teach coated or jacketed wires for use the arc wire spraying process. Haug et al. '342 teach a material wire for use in arc wire spraying comprising a metallic coating and ceramic filler (e.g., claims 1 and 4). Therefore, as Haug et al. '342 clearly teaches a material wire comprising a metallic coating and ceramic filler provides the advantage of a particularly good wire for making coating on cylinder running surfaces (paragraph [0075j), it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to use a wire comprising a metallic coating and a ceramic filler as at least one of the wires of the arc wire spraying method of Haug et al. `643 which is applied to a cylinder (see the Examples).

In response, Applicants point out that Haug et al. '342 teach a sheath of metal and a core of one or more alloy components. While there is suggestion that some amount of ceramic may be included as filler, there is no suggestion for the amount of ceramic, and the reaction to form the layer. In particular, there is no suggestion for the present limitation that the metal or the metal alloy of the composite wire reacts to the extent that unreacted metal or metal alloy constitutes less than 10 vol.% of the formed composite material as presently claimed.

Accordingly, withdrawal of the rejection is respectfully requested.

Claims 1-4, 6-17, and 19-22 are rejected under 35 U.S.C. 103(a) as obvious over Haug et al. (US 2002/0034643) in view of Claussen et al. (US 6,025,065).

Haug et al. teach a process for producing a composite material and the product made thereby as described above.

Haug et al. do not specifically teach the amount of ceramic particles and metal or metal alloy that react to form the composite.

In addition to the arguments set forth above, Claussen et al. teach a ceramic formed body comprising 5 to 70 vol. % of at least one intermetallic phase and 30 to 95 vol. % of at least one or more ceramic phases results in a strong and non-brittle product (column 3, lines 28-62). These amounts overlap that taught by Applicant (e.g., present claim 17). Therefore, as Claussen et al. clearly teach a ceramic formed body comprising 5 to 70 vol. % of at least one intermetallic phase and 30 to 95 vol. % of one or more ceramic phases provides the advantage of a strong and non-brittle product (column 3, lines 28-62), it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to form the composite material of Haug et al. with intermetallic and ceramic phases within the ranges taught by Claussen et al.

Therefore, as Haug et al. in view of Claussen et al. teach the same components claimed (metal or metal alloy wire and ceramic particles), in overlapping proportions (as taught by Claussen), used in the same manner claimed (arc wire spraying), it is expected that the components will interact in the same manner as claimed. Thus the amount of interaction between the ceramic particles and metal or metal alloy is expected to be in the ranges claimed.

Applicants respectfully traverse,

Claussen et al teaches sintering. Sintering is a very long process compared to depositing time of some hundred milliseconds. The resulting intermetallic compoundsof Claussen et al would inherently be differerent. The sintering process between the constituents of a compact green body does not be comparable with the "reaction during depositing in the wire arc process". The sintering takes place within minutes or hours of reaction time in a "dense" compact whereas during wire arc deposition the time for reaction is only some few seconds or less.

Regarding claim 17, Haug et al. in view of Claussen et al. does not teach the porosity of the product. However, as like materials in like proportions are formed in a like manner, the porosity is expected to be as claimed.

As discussed above, sintering produces a dense compact material. Thus, it can not be presumed that porosity is the same.

Regarding claim 19, Haug et al. in view of Claussen et al. does not teach the content of free metallic aluminum of the product. However, as like materials in like proportions are formed in a like manner, the content of free metallic aluminum is expected to be as claimed.

In response, Applicants point out that they are forming a LAYER by a specified PROCESS, which layer has unique composition and properties. Thus, claim 19 is allowable over this combination of references.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haug et al. (US 2002/0034643) in view of Claussen et al. (US 6,025,065) as described above, and further in view of Haug et al. (US 2002/0028342).

Haug et al. '643 in view of Claussen et al. teach a process for producing a composite material and the product made thereby as discussed above.

Haug et al. '643 in view of Claussen do not teach coated or jacketed wires for use the arc wire spraying process.

Haug et al. '342 teach a material wire for use in arc wire spraying comprising a metallic coating and ceramic filler (e.g., claims 1 and 4). Therefore, as Haug et al. '342 clearly teaches a material wire comprising a metallic coating and ceramic filler provides the advantage of a particularly good wire for making coating on cylinder running surfaces (paragraph [0075]), it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to use a wire comprising a metallic coating and a ceramic filler as at least one of the wires of the arc wire spraying method of Haug et al. `643 which is applied to a cylinder (see the Examples).

In response, Applicants refer the Examiner to the limitations of claim 1 as amended, and as discussed above, from which claim 5 depends, and further submit that claim 5 depends from allowable claim 1.

Withdrawal of the rejections is respectfully requested.

Allowable Subject Matter

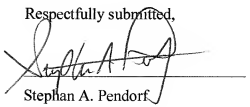
The Examiner indicates that claim 18 would be allowable if rewritten to overcome the objections as well as the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office Action …

Claim 18 has been amended to independent form. Indication of allowance is respectfully requested.

The Commissioner is hereby authorized to charge any fees which may be required at any time during the prosecution of this application without specific authorization, or credit any overpayment, to Deposit Account Number 16-0877.

Favorable consideration and early issuance of the Notice of Allowance are respectfully requested. **Should further issues remain prior to allowance, the Examiner is respectfully requested to contact the undersigned at the indicated telephone number.**

Respectfully submitted,



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